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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/621,464	07/18/2003	Wayne L. Johnson	071469-0304543	1154
909	7590	07/22/2005	EXAMINER	
PILLSBURY WINTHROP SHAW PITTMAN, LLP P.O. BOX 10500 MCLEAN, VA 22102			MACARTHUR, SYLVIA	
			ART UNIT	PAPER NUMBER

1763

DATE MAILED: 07/22/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/621,464

Applicant(s)

JOHNSON ET AL.

Examiner

Sylvia R. MacArthur

Art Unit

1763

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 July 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-36 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-36 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 22 July 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 7/22/2003.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 2, 10-14, and 34 are rejected under 35 U.S.C. 102(b) as being anticipated by Kagatsume et al (US 4,908,095)

Regarding claim 1: Kagatsume et al teaches a vertically translatable chuck assembly for supporting a workpiece at different locations within a plasma reactor chamber having sidewalls surrounding an interior region, comprising:

a chuck base (lower electrode 20) having a perimeter, an upper surface and lower surface;

at least one support arm 10 and 72 extending outwardly from said perimeter to said

sidewalls so as to support said chuck base within said interior region;

a workpiece support member 21 having a lower surface and an upper surface

capable of supporting the workpiece, arranged above said chuck base upper surface;

and

one or more vertical translation members lifter 19 arranged between and operatively

connecting said chuck base and said workpiece support member for supporting and

vertically translating said workpiece support member relative to said chuck base.

Art Unit: 1763

Regarding claim 2: An assembly according to claim 1, wherein one or more of said at least one support arm 10 and 72 is adapted to provide mechanical, fluid, electrical and/or pneumatic communication from outside the plasma reactor chamber to said chuck assembly, see col.7 lines 58-65.

Regarding 10: An assembly according to claim 1, further including mechanical means (lifter 19) for vertically translating said workpiece support member relative to said chuck base, see col.5 lines 33-45.

Regarding 11: An assembly according to claim 10, further including a vertical drive motor 24 external to the plasma reactor chamber and in operable communication with said vertical translation members through one said support arm.

Regarding 12: An assembly according to claim 1, wherein said workpiece support member (lower electrode 20) includes one or more cavities (space 93 and 4 through-holes) adapted to receive and circulate cooling fluid within said workpiece support member, and further including a cooling system arranged external to the plasma reactor chamber and in fluid communication with said one or more cavities via one or more cooling fluid lines passing through one said support arm, see col. 5 lines 58-68.

Regarding 13: An assembly according to claim 1, The apparatus of Kagatsume et al further including bellows 27 connected at one end to lower surface of the workpiece support member, and at the opposite end upper surface of the chuck base, see col. 5 lines 52-64.

Regarding claim 14: An assembly according to claim 1, further including a control system 601 (see Fig.8) coupled to the vertical translation members for controlling their vertical translation.

Art Unit: 1763

Regarding claim 34: A method of providing for uniform, substantially axially symmetric flow of plasma gas over a workpiece in a plasma reactor chamber having a central axis and capable of containing a plasma in an upper interior region of the chamber, comprising: supporting a chuck assembly within the reactor chamber with a plurality of support arms such that gas can flow around the chuck assembly from the upper interior region; arranging a vacuum pump system along the central axis adjacent the chuck assembly opposite the upper interior region, see abstract and col. 8 lines 31-45; providing the workpiece to the chuck assembly such that the workpiece is supported adjacent the upper interior region; flowing gas into the upper interior region and forming a plasma in the upper interior region; and activating the vacuum pump system (see col. 7 lines 31-45) so as to draw gas from the upper interior region over the workpiece and into the vacuum pump system.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 7, 15-17, 35, and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kagatsume et al (US4,908,095).

The teachings of Kagatsume et al were discussed above.

Art Unit: 1763

Kagatsume et al fails to specifically teach that one or more utility lines and ports pass through the support arm. However, col.9 lines 55-57 teach that arm 10 is extended into chamber 1 and a wafer W is sucked onto the arm 10. This teaching suggests that a utility port and line is provided in the arm to provide suction and ensure that the wafer remains attached to the arm during transfer. Thus, it would have been obvious for one of ordinary skill in the art at the time of the claimed invention to provide one or more utility lines and ports in the arm of Kagatsume et al.

Regarding claims 15, 35, and 36: Kagatsume et al teaches a plasma reactor system for processing a workpiece, comprising: a plasma reactor chamber having a central axis and sidewalls surrounding an interior region capable of supporting a plasma in an upper part of the interior region; a chuck assembly arranged adjacent said upper part of the interior region and along the central axis, the chuck assembly including:

- a chuck base having a perimeter, an upper surface and lower surface,
- at least one support arm extending outwardly from said perimeter to said sidewalls so as to support said chuck base within said interior region,
- a workpiece support member having a lower surface and an upper surface capable of supporting the workpiece, arranged above the chuck base upper surface, and one or more vertical translation members arranged between and operatively connecting said chuck base and said workpiece support member for supporting and vertically translating said workpiece support member relative to support said chuck base as discussed in claim 1 and
- a vacuum pump system (pumps 151 and 150).

Art Unit: 1763

However, Kagatsume et al fails to teach that the pump is arranged adjacent said chuck assembly opposite said upper part and along the central axis. Modifying the apparatus of Kagatsume et al to change the location of the pump is an obvious matter of design. In that the essential elements of the apparatus exist and the location of the pump system would still function as taught by Kagatsume et al. Thus, it would have been obvious for one of ordinary skill in the art at the time of the claimed invention modify the apparatus of Kagatsume et al to be located as recited in claim 15.

Regarding 16: A system according to claim 15, wherein said vacuum system includes a vacuum pump (150,151) and a gate valve 115 arranged between the chuck assembly and the vacuum pump.

Regarding 17: A system according to 15, Kagatsume et al further includes a workpiece load chamber 13 with a sealable door (16a,b 18a,b) in communication with the interior region and arranged so that a workpiece can be placed into the interior region and onto the workpiece support member.

4. Claims 7, 20-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kagatsume et al (US4,908,095) in view of Rossman et al (US 6,077,357).

The teachings of Kagatsume et al were discussed above.

Kagatsume et al fails to teach a cooling system in fluid communication with said workpiece support member via one or more cooling lines through said support arm.

Art Unit: 1763

Rossman et al teaches coolant channels 144,146 are received through the mass of the substrate support member 16. This channels and auxiliary cooling lines (utility is cooling fluid)are provide to facilitate heat transfer of the support. Thus, it would have been obvious for one of ordinary skill in the art at the time of the claimed invention to provide cooling lines through the support arm of Kagatsume et al.

Regarding Claim 21: The apparatus of Rossman et al further including a gas supply system in pneumatic communication with said interior region, for supplying gas for forming the plasma.

Regarding claim 22: The apparatus of Kagatsume et al further includes a workpiece handling system in operable communication with said load chamber, for transporting wafers to and from said workpiece support member through the load chamber, see col. 7 line 58- col.8 line 14.

Regarding claim 23: The apparatus of Nagatsume et al further includes a plasma source generator arranged around the outside of the plasma reactor chamber so as to surround the upper part of the interior region, see Fig. 5

Regarding claim 24: The apparatus of Nagatsume et al further includes a control system 601 in electrical communication with said plasma source generator, said gas supply system, said cooling system, said RF power supply, and said vacuum system, for controlling the operation of the plasma reactor system.

Regarding claim 25: The apparatus of Nagatsume et al further includes further including a control system (controller 601) in electrical communication with said vertical translation members for controlling their vertical translation.

5. Claims 8 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kagatsume et al (US4,908,095) in view of Wang et al (US 6,537,011).

Art Unit: 1763

The teachings of Kagatsume et al were discussed above.

Regarding claim 8: Kagatsume et al fails to teach an assembly according to claim 7, wherein said one or more utility ports includes at least one of: a helium port, a nitrogen port, a thermocouple port, a current monitor port, a pneumatic push-pin supply port an electrostatic clamp port and a voltage probe port.

Wang et al teaches an apparatus for transferring and supporting a substrate wherein The support member 106 is provided with a temperature controlled base with suggested teachings of fluid channel, heating elements, and other temperature control members (e.g, thermocouples). Thus, it would have been obvious for one of ordinary skill in the art at the time. of the claimed invention to provide the support member of Kagatsume et al with utility ports that will accommodate the suggested auxiliary process control equipment of col. 5 lines 1-9 of Wang et al. This improves the overall process control and uniformity of the process result.

Regarding 9: An assembly according to claim 7, wherein said utility lines are gathered into a flexible cable designed to accommodate vertical translation of said workpiece support member relative to said chuck base..

Wang et al is provided with element 102, which binds the lines from the support member and keeps them in one location for ease of maintenance.

6. Claims 3-6, 18, 19, and 26-33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kagatsume et al (US4,908,095) in view of Rossman et al and Barnes et al (US 6,776,170).

The teachings of Kagatsume et al were discussed above. Kagatsume et al fails to teach a match network.

Rossman et al teaches a match network in col. 6 and 7.

Art Unit: 1763

The motivation to provide a match network as illustrated in Figs. 2a-c is to provide an enhanced mode of generating plasma.


Rossman et al fails to teach that the match network is mounted to the support member.

Barnes et al teaches an RF power supply 140 is connected to the substrate support member 130 through a conventional RF impedance match network 145. The motivation to provide a support member with a match network is to enhance plasma generation and control it within the chamber.

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sylvia R. MacArthur whose telephone number is 571-272-1438. The examiner can normally be reached on M-F during the core hours of 9 a.m. and 3 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on 571-272-1435. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


Sylvia R. MacArthur
Patent Examiner
Art Unit 1763

June 27, 2005